ELSEVIER

Drug and Alcohol Dependence 43 (1996) 155–161

DRUG and ALCOHOL DEPENDENCE

Neighborhood environment and opportunity to use cocaine and other drugs in late childhood and early adolescence

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Received 2 February 1996; accepted 21 August 1996

Abstract

We hypothesized that neighborhood disadvantage might function as a determinant of 'exposure opportunity', an intermediate step on a path toward starting to use drugs illicitly. Testing this hypothesis, we analyzed self-report data gathered in 1992 by means of confidential interviews with 1416 urban-dwelling middle-school participants in a longitudinal field study. Within this epidemiologic sample, 50 youths said that someone actively had offered them a chance to take cocaine or smoke crack; tobacco had been offered to 395 youths; alcohol to 429 youths. Using multiple logistic regression to hold constant grade, sex, minority status, and peer drug use, we found a moderately potent association between neighborhood disadvantage and exposure to cocaine: youths living in the most disadvantaged neighborhoods (highest tertile) were an estimated 5.6 times more likely to have been offered cocaine, as compared to those in relatively advantaged neighborhoods ($P = 0.001$). By comparison, there were weaker but statistically significant associations involving tobacco exposure opportunity (odds ratio, OR = 1.7, $P = 0.004$) and alcohol exposure opportunity (OR = 1.9, $P = 0.0005$). Future research will clarify the etiologic significance of neighborhood disadvantage in pathways leading toward illicit drug use.

Keywords: Cocaine; Environment; Epidemiology; Neighborhood

1. Introduction

One goal of prevention research is to identify potentially modifiable risk factors for drug use among adolescents, with the aim of being able to target appropriate intervention programs to reduce risk and harm associated with drug use. Despite an overwhelming focus of prevention research on individual-level risk factors such as antisocial behavior, a growing number of studies implicate aspects of family, school, and neighborhood environment (Richman, 1977; Donovan and Jessor, 1978; Blount and Dembo, 1984; Dembo et al., 1985; Needle et al., 1986; Kandel and Andrews, 1987; Newcomb et al., 1987; Skager and Fisher, 1989; Hops et al., 1990; Dielman et al., 1990–91; Gifford and Hine, 1990–91; Brook et al., 1991; Dohrenwend et al., 1992; Hawkins et al., 1992; Smart et al., 1994; Chilcoat et al., 1995; Nurco et al., 1996).

In some investigations, the association between neighborhood and drug involvement has been seen at the level of individuals, and not just at an ecological level. For example, in the classic study of veterans who had become dependent on opioids in Vietnam, Helzer (1985) found that stateside re-addiction to opioid drugs was more likely to have occurred among veterans who had returned to live in urban areas of the United States. Also using individual-level measurements, Smart et al.

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PII S0376-8716(96)01298-7

(1994) found substance use problems to be most numerous in residential areas with the lowest socioeconomic status. Nonetheless, there also is a tradition of ecological research on this topic, where the associations with neighborhood characteristics have been studied by comparing the rates of drug involvement for different neighborhoods. For example, Richman (1977) used the New York City narcotics addict registry to estimate addiction rates for individual census tracts. He then compared these rates to show that tract-level characteristics such as mean household income and poverty level were associated with higher rates.

Some theorists have favored a 'drift hypothesis' to account for findings such as these, invoking the idea that migration to disadvantaged areas occurs after drug-taking begins, perhaps in order to facilitate proximity to areas where drugs are sold. This explanation seems quite plausible for emancipated adolescents and adults, once drug-taking occurs. However, in the instance of drug use among grade school children and adolescents, it is the parents of these youths that have 'drifted' to these neighborhoods. Other theorists stress social selection or causation hypotheses over drift hypotheses, invoking the idea that a downward drift might account for some of the observed association, but so might the dynamic interplay of neighborhood and individual-level characteristics (e.g., see Dohrenwend et al., 1992). Thus, among drug-naive youngsters living in inner-city environments, the neighborhood context might promote new occurrence of drug involvement. Our own view is that this hypothesized impact of neighborhood as a determinant of drug involvement might be seen most clearly in the earliest stage of drug involvement—namely, at the stage of first 'exposure opportunity' before which drug-taking cannot begin (Anthony and Helzer, 1995).

This separation of 'exposure opportunity' from actual drug use has appeared previously in the research literature on drug dependence and is consistent with a general conceptual model that decomposes transitions and progressions within developmental pathways leading toward clinically recognizable syndromes of drug dependence, specifying different determinants of transitions from one stage to the next, as well as theoretically separable determinants of progression along dimensions of drug involvement within each stage (Anthony, 1991; Stenbacka et al., 1993). Extending two-stage and three-stage conceptual models (e.g., Gorsuch and Butler, 1976; Robins et al., 1977; Robins, 1977a,b; Helzer, 1985), some investigators posit that determinants of initial drug use sometimes differ from those of later more serious drug involvement (e.g., Clayton, 1992; Anthony and Helzer, 1995).

In this paper, we extend our research team's recent work on the separate determinants of drug use (Chilcoat et al., 1995; Schütz et al., 1996) and drug dependence (Anthony et al., 1994) to consider whether characteristics of neighborhood might be important at very early stages of progression. We hypothesized that neighborhood disadvantage might function as a determinant of 'exposure opportunity', and our expectation was that the opportunity to use cocaine would be most strongly related to this aspect of neighborhood. We anticipated that more ubiquitous drugs, such as tobacco and alcohol, would have weaker associations with neighborhood disadvantage.

Here, neighborhood disadvantage can be understood in relation to what Richard Clayton has described as 'neighborhood context' risk factors for drug involvement, where he draws a distinction between 'being poor' as an individual characteristic and 'living in a poor neighborhood' as a contextual risk factor (Clayton, 1992). Just as Nurco et al. (1996) have approached 'social pathology' of the neighborhood, we have conceived of neighborhood disadvantage as a more general contextual characteristic than simply 'living in a poor neighborhood'. Our approach has been to specify neighborhood disadvantage as a dimension well-measured by interview items on poverty (e.g., 'there are a lot of poor people in my neighborhood'), but also by interview items on safety (e.g., 'there are plenty of safe places to walk or play'), neglect (e.g., 'broken bottles and trash lying around,' 'abandoned and boarded up buildings') and others as listed in Table 1. This type of neighborhood advantage or disadvantage has been presumed to influence drug-taking. For example, Clayton states "where a person grows up and lives influences the probability that he or she will have an opportunity to use drugs and will, in fact use them" (Clayton, 1992, p. 43). We are not aware of any published evidence on whether neighborhood disadvantage is associated with opportunity to use cocaine or other drugs, and this is the primary research issue in the present study.

2. Methods

In a field experiment organized by the Johns Hopkins University Prevention Research Center (Kellam and Anthony, submitted for publication), all children entering the first grade in 1985 and 1986 were recruited from 19 city schools. A total of 2311 enrolled in the experiment. Periodically since then, the school children remaining in the city schools have been asked to complete interviews to assess their initiation of drug use as well as other personal and environmental characteristics. Baseline characteristics for the 1985 cohort showed that 64% of the total sample were African-American, representative of the distribution in the Baltimore City school system. Twenty-nine percent of the sample were white, and 7% were of other racial-ethnic groups. The sample was evenly distributed by gender: 51% were

Table 1
Items[a] used to assess neighborhood disadvantage

	True[b]	False[b]
Within walking distance of my house there is a park or playground where I like to walk and enjoy myself, playing sports or games	0	1
There are plenty of safe places to walk or play outdoors in my neighborhood	0	1
Every few weeks, some kid in my neighborhood gets beat-up or mugged	1	0
Every few weeks, some adult gets beat-up or mugged in my neighborhood	1	0
In my neighborhood, I see signs of racism and prejudice at least once a week	1	0
In my neighborhood, many yards and alleys have broken bottles and trash lying around	1	0
I have seen people using or selling drugs in my neighborhood[c]	1	0
In the morning or later in the day, I often see drunk people on the street in my neighborhood	1	0
Most adults in my neighborhood respect the law	0	1
There are abandoned or boarded-up buildings in my neighborhood	1	0
I feel safe when I walk around my neighborhood by myself	0	1
The people who live in my neighborhood often damage or steal each other's property	1	0
The people who live in my neighborhood always take care of each other and protect each other from crime	0	1
Almost everyday I see homeless people walking or sitting around in my neighborhood	1	0
In my neighborhood, the people with the most money are the drug dealers	1	0
In my neighborhood, there are a lot of poor people who don't have enough money for food and basic needs	1	0
For many people in my neighborhood, going to church on Sunday or religious days is a very important activity	0	1
The people who live in my neighborhood are the best people in the world	0	1

Data from the Prevention Research Center, Johns Hopkins University School of Hygiene and Public Health.
[a] This scale was adapted and modified from one initially developed by Elliott and colleagues for use in the National Youth Survey (28).
[b] The scoring of true and false answers for the individual items is shown in these columns. The item scores are summed yielding an overall scale score from 1 to 18, with higher scores indicating a greater degree of neighborhood disadvantge.
[c] This item was dropped from the scale for analyses reported in Table 3, model 2.

girls. A total of 162 parents refused to give consent for their children to participate at the time of study enrollment; under 5% withdrew consent after initial participation. A much larger source of attrition was the child leaving the school system between 1985 and 1992. Additional details on the population base, sampling, research methodology and consent procedures for the Prevention Research Center investigation are described elsewhere (Kellam et al., 1991; Chilcoat et al., 1995).

In the Spring of 1992, a total of 1416 of the study participants were re-interviewed, most at the time were entering the sixth and seventh grades (61% of the originally recruited sample, and virtually all of the youths who continued to be enrolled in the city schools). The direct face-to-face confidential interviews were done with each youth privately. Interviewers were trained with particular emphasis on engagement with the youth, and the development of trust and rapport prior to the onset of the interview. A Certificate of Confidentiality was obtained to increase the level of protection for the youths when disclosing information regarding illicit drug use. Data gathered as part of the 1992 assessments were used in this study. It was not possible to test our cocaine hypothesis using data from earlier years because it was not until 1992 that a sufficient number of children had an 'exposure opportunity' for cocaine use.

The standardized interview covered the use of alcohol, tobacco, marijuana, cocaine, inhalants and other substances, as well as 'exposure opportunity'. For example, exposure opportunity for cocaine was assessed by asking "Have you ever been offered crack or cocaine to take?" In addition, the interview included an adaptation of standardized scales developed by others to measure peer drug use and related topics (Capaldi and Patterson, 1989).

Neighborhood environment was assessed using an 18-item scale, a modification of an instrument originally developed by Elliott and colleagues (Elliott et al., 1989). The items in this scale were scored so that higher scores indicated a greater degree of neighborhood disadvantage (Table 1). The coherence of the neighborhood disadvantage construct and the reliability of this scale are reflected in moderate to high factor loadings ($\lambda \geq 0.65$) for items on poverty, safety and other facets of neighborhood disadvantage that we have discussed in our introduction and by a Kuder–Richardson (KR20) internal consistency reliability statistic of 0.85.

Logistic regression was used to examine the association between neighborhood disadvantage and reported opportunity to use each specific drug as indicated by the odds ratio. Using this model, gender (being male) was held constant, as was grade in school, minority status (African–American, Asian–American, Hispanic–American or native American), and drug use by peers. A series of subsidiary analyses were conducted to evaluate the neighborhood scale as a continuous variable. These subsidiary analyses did not change the study's conclusions.

In our statistical modeling, we focused on peer drug use and not on other suspected determinants (e.g., conduct problems, prior use of other drugs and parental drug use) for three main reasons. First, drug use by peers is now regarded as the most important causal risk factor for youthful drug involvement, overshadowing the influence of suspected risk factors such as parental drug use, and conduct problems. As such, it was important to check whether any observed association between neighborhood disadvantage and exposure opportunity might be independent of the likely association between peer drug use and exposure opportunity, or whether the neighborhood association was wholly interdependent with the association involving peer drug use. Second, the sample included only 50 youths who reported an opportunity to use cocaine, and with such limited statistical power and so few cases, we could not extend the logistic regression model to incorporate variables such as conduct problems, prior use of other drugs, etc., once the peer drug use variable was included. Third, it can be argued that characteristics such as the youth's conduct problems and prior drug use, and even parental drug use, are more influenced by neighborhood disadvantage than influences on neighborhood disadvantage. Further, the influence of neighborhood disadvantage on a youth's exposure opportunity for cocaine use can be mediated by these same variables. Hence, for the theorist interested in learning about neighborhood disadvantage, the regression model is mis-specified if it controls for these possibly mediating variables as if they solely functioned as confounding variables. In light of these considerations, it seemed best to look first for an association between neighborhood disadvantage and exposure opportunity for cocaine use, and to test for interdependency with peer drug use because it is the most prominent risk factor for youthful drug involvement. In future longitudinal research with larger samples, it should be possible to fit more complex models to throw light on the possibility that the neighborhood influence, if any, is mediated or confounded by other, less prominent suspected risk factors for youthful drug involvement (e.g., parental drug use).

3. Results

Whereas Table 1 reports the neighborhood scale, Table 2 shows the distribution of the participating youths who reported that they had been offered at least one of the specific drugs under study. Approximately 30% of the youths reported that they had been offered alcohol ($n = 429$), 28% were offered tobacco ($n = 395$), and 6% were offered marijuana ($n = 90$). A smaller proportion (3–4%) of the students reported having been offered crack or cocaine ($n = 50$), or inhalants ($n = 53$). A few students reported having been offered an opportunity to inject intravenous drugs (0.8%, $n = 11$). Boys reported being offered drugs more often than girls. Youths in higher grades (six through eighth grades) reported being offered drugs more frequently than those in earlier years (grades four and five). However, there were no significant differences by race-ethnicity. Peer drug use of any type was associated with exposure opportunity for every substance studied ($P < 0.05$).

The youths in the most disadvantaged neighborhoods had a greater likelihood of being offered each type of drug. However, the strength of this association varied by specific substance (Table 3). Consistent with our hypotheses, we found that students in the highest tertile of neighborhood disadvantage were more likely to have been offered cocaine relative to the lowest tertile (OR = 5.6, 95% CI, 2.0–16.1, $P = 0.001$). This was found in both unadjusted analyses (data not shown) and in multiple logistic regression analyses that held constant the student's grade, sex, race and report of peer drug use (Table 3, model 1). For tobacco and alcohol, the associations between exposure opportunity and neighborhood status were weaker as we had hypothesized (OR = 1.7, 95% CI, 1.2–2.5, $P = 0.004$; and OR = 1.9, 95% CI, 1.3–2.7, $P = 0.0005$, respectively).

Because of concern that the neighborhood scale item 'witness to drug traffic' might be responsible for the observed association, we removed this item from the scale and repeated the multiple logistic regression analyses. No change in conclusions were made when this scale item was removed and analyses repeated (Table 3, model 2).

4. Discussion

Having observed a moderately strong association between cocaine exposure opportunity and neighborhood disadvantage, we can offer a number of possible explanations. For example, one might expect street-level availability of drugs to be most common where police presence is lower and where there are other manifestations of general social and governmental neglect (e.g., street crime, abandoned buildings). Alternatively, neighborhood environment might be a context for situational cues that trigger specific drug-related behavior much as barroom locales have been found to do with alcohol (e.g., Strickler et al., 1979; Niaura et al., 1988; Rankin et al., 1983; Harford, 1983). There are other interpretations for this study's findings. For example, as we have measured it, low and high neighborhood disadvantage might reflect specific residential patterns of drug availability, or access to general or specific prevention and treatment programs in the local community (Tremblay et al., 1991, 1992).

Table 2
Frequency of being offered cocaine and other substances reported by middle-school participants for each tertile of neighborhood environment and other characteristics

Substances offered[a]	None	Alcohol	Tobacco	Inhalants	Marijuana	Crack/cocaine	IV drugs	Total
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Sex								
Girls	428 (55.4)	179 (41.7)	188 (47.6)	17 (32.1)	41 (45.6)	21 (42.0)	8 (72.7)	722 (51.0)
Boys	344 (44.6)	250 (58.3)	207 (52.4)	36 (67.9)	49 (54.4)	29 (58.0)	3 (27.3)	694 (49.0)
Race-ethnicity								
Minority[b]	626 (81.1)	336 (78.3)	304 (77.0)	39 (73.6)	68 (75.6)	41 (82.0)	9 (81.8)	1130 (79.8)
White	146 (18.9)	93 (21.7)	91 (23.0)	14 (26.4)	22 (24.4)	9 (18.0)	2 (18.2)	286 (20.2)
Grade[c]								
4-5	153 (19.8)	63 (14.7)	48 (12.2)	10 (18.9)	9 (10.0)	5 (10.0)	3 (27.3)	244 (17.3)
6-8	618 (80.2)	366 (85.3)	345 (87.8)	43 (81.1)	81 (90.0)	45 (90.0)	8 (72.7)	1169 (82.7)
Peer drug use[d]								
Tobacco	192 (24.9)	245 (57.2)	255 (64.7)	41 (77.4)	66 (73.3)	29 (58.0)	5 (45.4)	551 (39.0)
Alcohol	208 (26.9)	275 (64.2)	237 (60.2)	43 (81.1)	66 (73.3)	34 (68.0)	8 (72.7)	584 (41.3)
Marijuana	36 (4.7)	95 (22.2)	95 (24.1)	16 (30.2)	52 (57.8)	19 (38.0)	5 (45.4)	164 (11.6)
Crack/cocaine	29 (3.8)	45 (10.5)	44 (11.1)	8 (15.1)	18 (20.0)	15 (30.0)	4 (36.4)	93 (6.6)
Any drug	292 (37.8)	337 (78.6)	312 (79.0)	47 (88.7)	77 (85.6)	41 (82.0)	9 (81.8)	776 (54.8)
Neighborhood disadvantage[e]								
Lowest tertile	228 (29.5)	84 (19.6)	82 (20.8)	8 (15.1)	12 (13.3)	5 (10.0)	0 (0.0)	357 (25.2)
Middle tertile	284 (36.8)	156 (36.4)	132 (33.4)	22 (41.5)	31 (34.4)	13 (26.0)	3 (27.3)	508 (35.9)
Highest tertile	259 (33.6)	188 (43.8)	181 (45.8)	23 (43.4)	47 (52.2)	32 (64.0)	8 (72.7)	549 (38.8)
Total (%)	772 (54.5)	429 (30.3)	395 (27.9)	53 (3.7)	90 (6.4)	50 (3.5)	11 (0.8)	1416

Data from the Prevention Research Center, Johns Hopkins University School of Hygiene and Public Health, 1992.
[a] The percentages shown are not 'prevalence of exposure opportunity' for each drug, but rather they are column-wise distributions to show how each exposure opportunity sub-group is distributed. For example, in the race-ethnicity row, there is a fairly constant 80:20 proportional representation of minority versus white youth in all of the exposure opportunity sub-groups.
[b] The minority racial group is comprised mainly of youths from African–American descent (98%).
[c] Information on grade is not available for three youths (two from among those offered tobacco, and one youth among those not offered drugs). These youths are not included in analyses involving this variable.
[d] Information was not available for peer inhalant use or peer intravenous drug use.
[e] One student did not provide information on neighborhood environment among those offered alcohol and is not included among analyses involving these variables. In addition, one student among those not offered any substances did not provide information on neighborhood environment and is excluded from analyses of these variables.

In contrast to the findings for cocaine exposure opportunity, we anticipated and found substantially weaker relationships for tobacco and alcohol. Neighborhood disadvantage may be less important for these more ubiquitously used drugs. To promote development of a more complete conceptual model for the determinants of 'exposure opportunity', it may be helpful to underscore the observed relationships with sex (being male), age or grade in school, and peer drug use. In particular, the importance of peer drug use in explaining youthful drug use may be seen first as an increased number or density of exposure opportunities and then as an increase in frequency and occurrence of actual drug-taking. Studies to decompose these two separate mediational pathways from peer drug use to youthful drug-taking are needed in our agenda for research on this topic. As discussed in the methods section, longitudinal research with larger samples is needed to disentangle the possibility that neighborhood disadvantage might influence exposure opportunity by virtue of mediational pathways where characteristics such as peer drug use, parental drug use, and conduct problems function as mediators of this influence rather than as confounding variables.

Whereas most theorists assume that opportunity to use drugs is a strong determinant of actual drug use (e.g., Clayton, 1992; Anthony and Helzer, 1995), there actually is little empirical research on this relationship. This topic also merits attention in the agenda for future research on youthful drug use. As the present study sample matures, it will become possible to extend the research in this direction, but we also note that the U.S. National Household Survey on Drug Abuse includes items on both 'exposure opportunity' and 'initiation of drug use'. While cross-sectional, these data should be analyzed to shed light on what might influence the transitions from opportunity to actual drug-taking as illustrated by the work of Stenbacka et al. (1993).

In summary, this study adds new epidemiologic findings on a suspected association between the neighborhood environment and the opportunity to use cocaine, as well as other drugs. The results highlight the poten-

Table 3
Adjusted ratio of odds for being offered a specific substance by tertiles of neighborhood disadvantage (model 1) and for being offered a specific substance by tertiles of neighborhood disadvantage after removing the drug traffic item from the scale (model 2)

Neighborhood disadvantage[a] (by score tertiles)	Model 1 adjusted odds ratio[b] (95% CI)[c]	Model 2 adjusted odds ratio[b] (95% CI)[c]
Tobacco		
Highest tertile	1.7 (1.2–2.5)***	1.7 (1.2–2.4)**
Middle tertile	1.2 (0.8–1.7)	1.0 (0.7–1.5)
Lowest tertile (reference)	1	1
Alcohol		
Highest tertile	1.9 (1.3–2.7)***	1.9 (1.4–2.8)***
Middle tertile	1.4 (1.0–1.9)	1.3 (0.9–1.8)
Lowest tertile (reference)	1	1
Inhalants[d]		
Highest tertile	3.4 (1.4–8.2)**	3.0 (1.3–6.9)**
Middle tertile	2.7 (1.1–6.3)*	1.9 (0.8–4.3)
Lowest tertile (reference)	1	1
Marijuana		
Highest tertile	2.2 (1.0–4.8)*	1.9 (0.9–4.0)
Middle tertile	1.9 (0.9–4.2)	1.5 (0.7–3.2)
Lowest tertile (reference)	1	1
Crack/cocaine		
Highest tertile	5.6 (2.0–16.1)**	6.5 (2.3–18.7)***
Middle tertile	2.2 (0.7–6.6)	2.2 (0.7–6.5)
Lowest tertile (reference)	1	1

Data from the Prevention Research Center, Johns Hopkins University School of Hygiene and Public Health, 1992.
[a] Results are presented by substance offered for three tertiles of neighborhood disadvantage. Results are not presented for intravenous use because the numbers were too small to calculate an odds ratio.
[b] Multiple logistic regression analyses were done holding constant students' grade, sex, race-ethnicity, and the report of peer use of the specific outcome drug. The outcome in each model is the report of being offered the specific drug. The non-cases are individuals who did not report being offered any drug.
[c] CI, confidence interval.
[d] Because information was not available on peer use of inhalants, these adjusted odds ratios were calculated holding constant grade, sex, and minority status.
* $P<0.05$, ** $P<0.01$ and *** $P<0.001$, based on the Wald statistic.

tial importance of the neighborhood environment in relation to 'exposure-opportunity' for the very early stages of drug involvement. This underscores a need for more research on neighborhood characteristics that signal increased risk of early drug use.

Acknowledgements

This work was supported by a Scientist Development Award for Clinicians from the National Institute on Alcohol Abuse and Alcoholism (AA00168), and by grant DA04392 from the National Institute on Drug Abuse.The authors acknowledge assistance from the many participants and colleagues who have joined in the prevention research partnership between Baltimore City Public Schools and the Johns Hopkins University and are especially grateful for sustained support from the Superintendent of Schools, central administration, principals, teachers, parents, and students.

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